Expansion of the Eastern Virginia Groundwater Management Area

Comments from Jesse Royal
In expanding the Eastern Virginia Groundwater Management District these are issues that I believe need to be address before this decision can be made.?

Economic Development Component
Availability is a vital component of economic development and the easy availability of it without overly burdensome regulations is necessary. Like wise the loss or over commitment of these resources can be devastating to an economy. During the severe drought that affected Atlanta areas competing for economic development with the Atlanta Area began to run ads stating that they had plenty of water and power for businesses to relocate.
These questions need to be answered

1. A 10 year cycle helps to prevent hording of resources by those who were first at the permit application however many projects need to know that water will be available over a longer term. Residential development projects often look at a 20 year cycle for 100% build out. Even though the majority may take place in 5 to 10 years there must be an understanding and guarantee that water will be available for the entire development period. In addition, industrial and residential projects may have a phased development that can last as long as 40 or 50 years. The success of the project is in knowing that water will be available for the project through out its development time frame. The current system of 10 years does not recognized this long term planning and may even require the investment of significant resources in design and planning before the question of water availability is answered. How can we be more reasonable?
2. Is the local economy strong enough to draw new businesses or to sustain existing businesses when the additional cost of these regulations occurs? In other words do drive business away from an area.
3. How is a rural economy different than a urban economy and how will these regulations affect them.
    a. For rural economies water and sewer services usually are developed by the industry or by the local government as part of securing the industry. If a groundwater protection area is in existence the current mechanism for allocation of water and permit review would put a rural community at a significant disadvantage or effectively kill projects because the question of water availability can not be answered in a reasonable time frame and cost effective manor.
    b. Urban economies will have water and sewer capacity in place. They also have the resources to request additional capacity and large distribution systems allow water to be moved around the community to the location where it is needed

Expanding Water Resources
Although there are economic considerations to expanding the Groundwater protection area the bottom line is that if the resources are used up and worse yet reduced due to overuse there won't be an economy to worry about. Therefore how do we bring the two issues together? We must look at not only expanding the ground water protection area but how do we expand resources?

1. Aquifer Storage and Recovery (ASR) is a technology/process that is not maturing as a feasible alternative. It is also significantly less costly, 10% to 33% of the

cost of a surface reservoirs and the time line for development is a fraction, 2 to 3 years, of surface water reservoirs if they can be permitted at all.
    a. ASR Projects can take excess surface water and injected treated water into wells for peak use.
    b. They can store water in Brackish Aquifers for later withdrawal
    c. They can be used to store treated effluent thereby offsetting the effects of pumping from the aquifer.
2. Use of Treated Effluent for non drinking water uses.
    a. Use of dual systems for potable and non potable uses must be encouraged
    b. State involvement through cost sharing, accelerated permitting, tax incentives or water use fees to fund these projects must be a component of the solution
3. Conservation is always an issue to be addressed but we must recognize that some communities and industries have ridden this pony to death. Where conservation can make improvement we must continue to improve. However where communities and industries have done an excellent job in this area we should recognize this and look to other areas for managing the resources.
4. Not allowing some uses to save water for critical uses. The major one is lawn irrigation.

Technical and Administrative Issues to be addressed

1. Use of water table aquifers with minimal permitting
2. Administrative Permits with out pre-modeling required
3. Timeliness of permit review and eliminating the guessing game
4. Out sourcing modeling and permit review
5. Requiring the use of dual systems
6. Allowing the use of ASR Wells
7. Subsiding the construction of transmission mains for effluent reuse in return for industries giving up current ground water allocations
8. Can we take both a localized and regional look at the upper, middle and lower Potomac aquifer to prevent major adjustments in water availability?
9. How can we give a permitee an idea of availability of water availability up front? I have applications that that been in process for 3 years.
10. Consideration of withdrawal request not only tied to a per connection basis but total developed area.

Comments from David Bailey

I think that we have to meet at least once in the new area proposed, just for public participation purposes.

As to substance, I think DEQ must embrace the entire area that impacts the aquifer(s) at issue in the groundwater management program set out by the GA. It is not only a question of meeting the intent of the GA, but if the area is to be regulated, leaving out third parties that impact the results invites litigation and hampers viable solutions. So, while I would expect some resistance from the northern neck, I see little option. A technical question may arise as to the degree that the northern neck impacts the aquifer - is it the same as others so they should be similarly regulated, or are they different in any way.

as to 3, I think the agency is forced, for both practical and staff reasons, to consider a 15 or 20 year withdrawal permit. Reopener provisions can address important new developments. Unfortunately, I think DEQ is going to be increasingly drawn into water conflicts, and I am not sure that DEQ even has the authority to decide water allocation issues. I have to wonder if we are limited to a system in which all DEQ and the State does is let each individual user draw down to his amount, then stop regardless of consequences, and how is that one user connected to other users other than just a common aquifer. The result is that DEQ becomes a de facto growth regulator and that, I think, still remains a legislative function. At the moment, does this mean that administratively DEQ has broader notice obligations, a duty to return to the GA or Water Commission, or what? Don't have the answer, just the complicated thought.

Comments from Lewis Lawrence

Regarding #2-

1. Given that DEQ staff is very short handed, both financially and administratively, my question relates to the ability of DEQ staff to administer essentially a doubling of the ground water management area-

a. How will DEQ staff ensure that permits and administrative actions be addressed in a timely matter. For the new localities "entering" the GWMA, this new regulatory blanket could be an economic disincentive if the permit processing time and DEQ staff response time exceeds the existing working capacity of the program

i. Are there examples of other programs administered by state agencies that require the General Assembly to ensure adequate funding be provide to administer the program and if not, the program essentially goes dormant or at least the regulated are no regulated until adequate funds are provide. This is the old "quid pro quo"

ii. Can the expansion of the GWMA be made contingent on the General Assembly providing adequate staff and resources to administer the program?

b. I hear anecdotally that the current wait time for permit approval and administrative action is very long for localities in the ground water management area.

i. Can a report be provided on the number of permits and administrative actions currently under way, when those actions were initiated and how long they have been in the que?

ii. Based on the above, can DEQ staff provide an estimate of what a doubling of the area would do for the issuance of permits based on the above. Localities will want some assurances that the expansion of the GWMA will be handled efficiently and expeditiously

Comments from Gayl Fowler

1. I would like us early on to talk about **grandfathering**. Can we safely grandfather current users without requiring them to raise pumps? Is this true across the Coastal Plain, or only in some sections of it? I believe this is the major stumbling block to acceptance of expansion of the Eastern GW Management Area.

2. You have presented lots of data on the artesian aquifers. However, the NOIRA suggests a major new use of **the water table aquifer** and we have not received any information on it.

The possibility of large scale use of this aquifer by agriculture has the potential to dry up hundreds of domestic wells. Is there any easy rule of thumb about the ensuing cones of depression that could guide the permitting? My understanding is that it could be done with a very expensive hydrogeological study. Our experience in the Northern Neck is that conditions are very site specific and we could not predict even within short distances what would happen.

This also opens up the question of need for regulation for the water table aquifer whether or not we recommend its use for agriculture. Suppose a farmer or industry wanted to move in tomorrow and do major withdrawals from the water table aquifer. I am not sure there are any regulations in place that would protect neighboring water table wells from drying up. It is my impression that the Health Department does not have guidance on this even when permitting two domestic wells near each other. I will check with them.

There is also very little to protect domestic wells from pollution by a neighbor. The biosolids TAC is just working on buffer zone recommendations and these do not address the differences in well construction and aquifer source. Extensive use of the water table aquifer by agriculture could involve farm chemcials or be combined with use of reclaimed water introducing the potential for contaminating nearby domestic wells that are used for drinking water.

The long term predictions on climate that we have been able to put together suggest that the water table aquifer may be under stress for the next 20 years. It may be advisable to restrict its use to domestic wells. The water tables that we monitor in two local wells have not recovered to the level of the 2007 drought. These wells are best restored by snow, and predictions are for relatively little snow for the foreseeable future.

3. **Reuse** -- DEQ has a two-page summary dated August 2009 entitled "Water Reclamaton and Reuse: Frequently Asked Questions" which you might like to distribute to the panel.

Comments submitted by Susan Douglas- VDH

The VDH – ODW recommends that the following procedures be modified in the Ground Water Withdrawal Regulations:

9 VAC 25-610-130. Conditions applicable to all permits.

Replace "At a minimum, a person must obtain a well construction permit or a well site approval letter from the Virginia Department of Health prior to the construction of any well."

with

"At a minimum, a joint (*pre-application meeting with)* or perhaps *(preliminary technical evaluation by*) the Department (of Environmental Quality) and the Department of Health must be conducted, and well construction restrictions established."

Rationale:

VDH does NOT issue "well construction permits", only "well site approval letters". This letter authorizes the owner to drill a well at a specified location. If the DEQ wishes to further prohibit "…the hydraulic connection of aquifers that contain different quality waters that could result in deterioration of water quality of an aquifer;" (paragraph B.4.g), then all well construction restrictions (gravel pack, aquifer screen placement) must be established by DEQ prior to the well site approval by VDH. A pre-application meeting / preliminary technical evaluation would also (ideally) establish a well yield test procedure acceptable to both agencies. This could also be communicated to the applicant in VDH-ODW's well site approval letter.

This modification would eliminate some of the problems we have experienced in the past with new wells for public water systems.

Emergency Well info from VDH-

I think that the information below must be shared with members of the RAP, and considered in DEQ's Regulations. The hospitals that have come to our attention thus far are outside the Ground Water Management Areas (existing and proposed). However, there are some rural hospitals in the coastal plain area that may be affected - one example of the need to include a definition of "emergency well" in DEQ's regulations. Since our assessment of source capacity for waterworks ("public water supplies") does not typically include "emergency wells", we will want to be clear on this definition.

From: Puckett, Richard (VDH)
Sent: Tuesday, September 22, 2009 7:58 AM
To: Dishman, Clarence (VDH); Childrey, Mitchell (VDH); Douglas, Susan (VDH)
Cc: Capito, John (VDH); Pellei, Steven (VDH); Botdorf, Daniel (VDH); Hull, Jeremy (VDH); Moore, James (VDH); Shahramfar, Mohsen (VDH)
Subject: RE: Pioneer Community Hospital

Susan and Others

FYI

The requirement for a second, "emergency source" of water for hospitals comes from the International Plumbing Code. The IPC is the DHCD adopted plumbing code.

SECTION 609

HEALTH CARE PLUMBING

609.1 Scope. This section shall govern those aspects of health care plumbing systems that differ from plumbing systems in other structures. Health care plumbing systems shall conform to the requirements of this section in addition to the other requirements of this code. The provisions of this section shall apply to the special devices and equipment installed and maintained in the following occupancies: nursing homes, homes for the aged, orphanages, infirmaries, first aid stations, psychiatric facilities, clinics, professional offices of dentists and doctors, mortuaries, educational facilities, surgery, dentistry, research and testing laboratories, establishments manufacturing pharmaceutical drugs and medicines, and other structures with similar apparatus and equipment classified as plumbing.

609.2Water service. All hospitals shall have two water service pipes installed in such a manner so as to minimize the potential for an interruption of the supply of water in the event of a water main or water service pipe failure.

Two examples:

Richlands Hospital had a well, which was permitted, etc.

Old, downtown Radford hospital had two service connections from different pressure zones.

Hospital's must be getting serious about uninterrupted service.

Dickie

From: Dishman, Clarence (VDH)
Sent: Monday, September 21, 2009 5:10 PM
To: Childrey, Mitchell (VDH); Douglas, Susan (VDH)
Cc: Capito, John (VDH); Pellei, Steven (VDH); Botdorf, Daniel (VDH); Hull, Jeremy (VDH); Moore, James (VDH); Shahramfar, Mohsen (VDH)
Subject: RE: Pioneer Community Hospital

I, too, got a call about one of these last week (for the hospital at Richlands, Va). I told the caller that ODW would have to handle it like a new public water system, just as Bill T. explained in his email.

Mike

From: Childrey, Mitchell (VDH)

Sent: Monday, September 21, 2009 4:09 PM

To: Douglas, Susan (VDH)

Cc: Capito, John (VDH); Pellei, Steven (VDH); Botdorf, Daniel (VDH); Hull, Jeremy (VDH); Moore, James (VDH); Dishman, Clarence (VDH); Shahramfar, Mohsen (VDH)

Subject: FW: Pioneer Community Hospital

Susan,

This is being forwarded as a heads up. Apparently there is a grant program (new??) for hospitals encouraging them to develop emergency wells. Bill, after discussion with me, sent the following email to an administrator at a small hospital connected to the Town of Stuart. We had a similar proposal for a hospital on the Lynchburg water system several years ago but was never developed. I don't know if there is a big promotion for these grants around the state or not.

From: Thompson, William (VDH)

Sent: Monday, September 21, 2009 2:59 PM

To: johnfrisco@phscorporate.com

Cc: Childrey, Mitchell (VDH); tostuart@sitestar.net; tilley@va.net; sslate@va.net

Subject: Pioneer Community Hospital

Mr. Frisco, we have no file or computer records for an old well water system serving this hospital. We understand its previous name was R J Reynolds Hospital. We also understand the hospital is currently served by the Town of Stuart Waterworks and that you are interested in pursuing a grant for an emergency water system supplied by a well.

There are some complications as I discussed with you on the telephone. In my subsequent discussion with my Deputy Field Director, Mitch Childrey, P. E., he noted that such systems have been discouraged in the past as there are normally other ways to improve water system reliability, and a private well connection constitutes a cross connection and such wells typically cannot provide fire flow.

You would need to have authorization from the Town of Stuart as connection of the well would violate their cross-connection control program and ordinance. If such a proposal were to proceed the Town could own and operate the public well system provided they are willing to take on the time and cost associated with this addition. This would help avoid some complications that the hospital owner would have if they retained ownership and proposed to operate the well as part of a public system. These complications are as follows:

- If the hospital maintained ownership a Waterworks Operation Permit would be required to be issued to the owner(s) of the hospital, I don't know of a similar system being permitted.
- Operation, a licensed operator would be required.
- An idle system can be problematic due to stagnant water conditions; water quality can deteriorate in such systems. Some means of continuous or periodic flushing might be needed. As we discussed periodic water quality testing would be necessary. Because this system would be interconnected with a system served by a surface water treatment plant the frequency of future testing and the number of parameters tested would probably increase (this is more than we discussed on the telephone), monitoring plans would need to be submitted and approved.
- A consulting engineer, registered in Virginia, would be required to design the waterworks; meet at a Preliminary Engineering Conference with representatives from this Office, the hospital and/or Town to discuss the project beforehand; and submit a Preliminary Engineering Report, plans and specifications for our review and approval process.
- We would need to determine if the system would be required to have Waterworks Business Management Plan, this depends on whether the owner already owns another waterworks that is being operated satisfactorily.
- We would need to approve a well site, the public water supply type well could then be drilled by a licensed well driller and the well tested in accordance with the *Waterworks Regulations*; testing is spelled out in more detail in the well site approval letter.
- The well lot must be surveyed and a recorded plat and dedication document provided.
- Note the well water may require treatment to meet public water supply standards.
- Once a construction permit is issued the well and it's appurtenances can be completed, we then receive a letter from the project (design) engineer and perform a final inspection before the Waterworks Operation Permit is issued.

- Routine operational monitoring, testing and reporting would be required.

Please refer to our website for additional information:

http://www.vdh.virginia.gov/drinkingwater/owners/permit_applications_wbop.htm

http://www.vdh.virginia.gov/drinkingwater/regulations.htm

Comments from Frank Fletcher

Additionally, as I observed in the RAP meeting, I would encourage a panel discussion on the 80-percent management level. First, should the 80-percent level be used at all or is there a better way to prevent damage to aquifers? Second, if the 80-percent level is to be used, then how should it be measured? (The current "half-way" method seems clunky to me.) Currently, I have an open mind on both questions.

A CASE FOR THE EXPANSION OF THE EASTERN VIRGINIA GWMA

In accordance with VAC 62.1-257, the State Water Control Board may initiate a ground water management area proceeding, whenever in its judgment there may be reason to believe that:

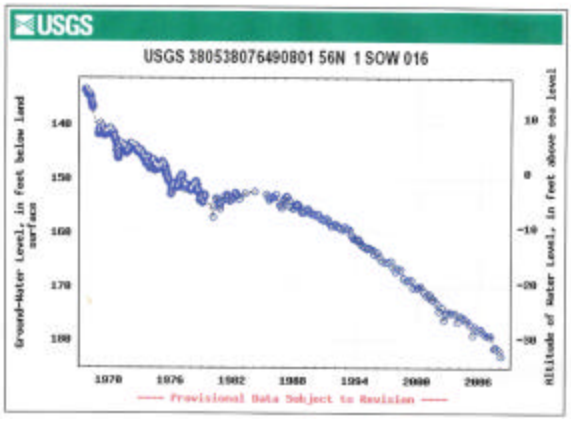
> *1. Ground water levels in the area are declining or are expected to decline excessively;*
>
> *2. The wells of two or more ground water users within the area are interfering or may reasonably be expected to interfere substantially with one another;*
>
> *3. The available ground water supply has been or may be overdrawn; or*
>
> *4. The ground water in the area has been or may become polluted. Such pollution includes any alteration of the physical, chemical or biological properties of ground water which has a harmful or detrimental effect on the quality or quantity of such waters.*

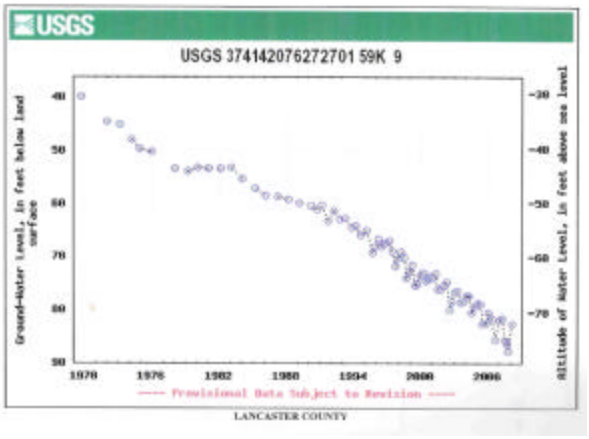
If the Board finds that any one of the conditions required above exists, and further finds that the public welfare, safety and health require that regulatory efforts be initiated, the Board shall by regulation declare the area in question to be a ground water management area.

Currently, ground water management is in force throughout the Eastern Shore, Southside Virginia, and the James-York Peninsula. Hydrologic evidence supports the judgment that other regions of the Virginia Coastal Plain, including the Middle Peninsula and the Northern Neck, should also be included in the Eastern Virginia GWMA. There is no doubt that Conditions 1 through 3 are met within the Middle peninsula and Northern Neck.

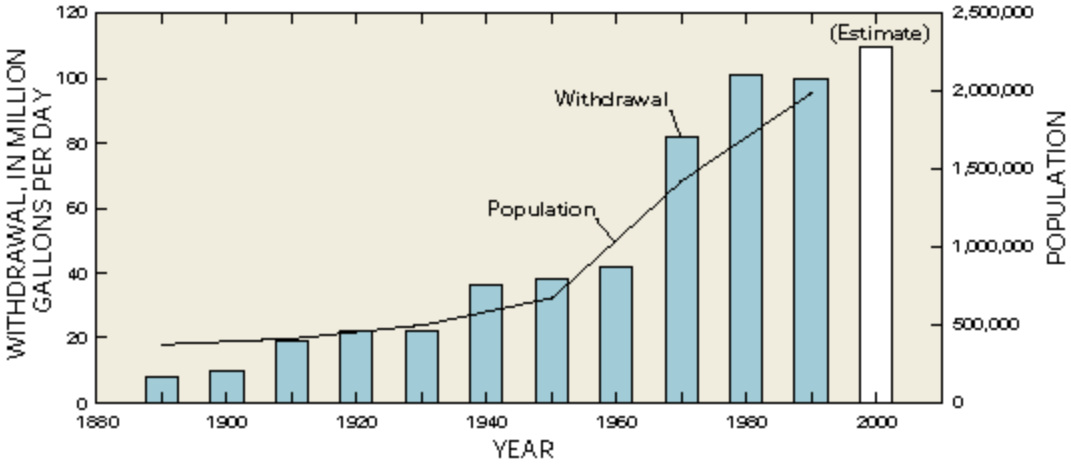
Condition 1

USGS hydrographs illustrate a long-term, persistent, and system-wide decline of groundwater levels (potentiometric surfaces) throughout the Middle Peninsula and Northern Neck. (From left to right: Montross, Westmoreland County and Kilmarnock, Lancaster County.)





Indeed, artesian water levels throughout the region have been declining for more than 100 years (see State Water Control Board Planning Bulletin 305 and 307). The rate of decline ranges from approximately one-foot per year to nearly three-feet per year. Given the direct relationship between population growth and groundwater withdraws on the Virginia Coastal Plain, which has been demonstrated by the USGS (see the chart below), it is reasonable to expect groundwater levels to continue to decline in the next few decades, at least. (The Theis equation demonstrates that drawdown [water level decline] will continue to occur as long as pumping rate increases with respect to time.)



Source: USGS

Condition 2

Well interference is the inevitable result of continued groundwater withdrawal, and on a regional scale it becomes increasingly common as withdrawals persist and artesian water levels decline. As the diagram on the next page illustrates, drawdown in the region between two or more interfering wells is summative. That is to say, if the drawdown produced by single pumped well in an observation well within its cone of depression is 10 feet and the drawdown produced by a second pumped well that creates an overlapping cone of depression is 15 feet in observation well, then the total drawdown in the observation will be the sum of the two individual drawdowns (10 ft + 15 ft = 25 ft).

Because of low values of storativity, confined aquifers produce extensive cones of depression when they are pumped, commonly stretching for tens of miles in radius from the pumping center. As more and more wells are constructed and pumped in a region, the cones of depression spread and coalesce (interfere), creating a potentiometric surface that resembles the cratered surface of the moon. With the passage of time, regional artesian water levels are forced to greater and greater depths not only because of increasing rates of groundwater withdrawal but also because of summative drawdown between interfering wells.

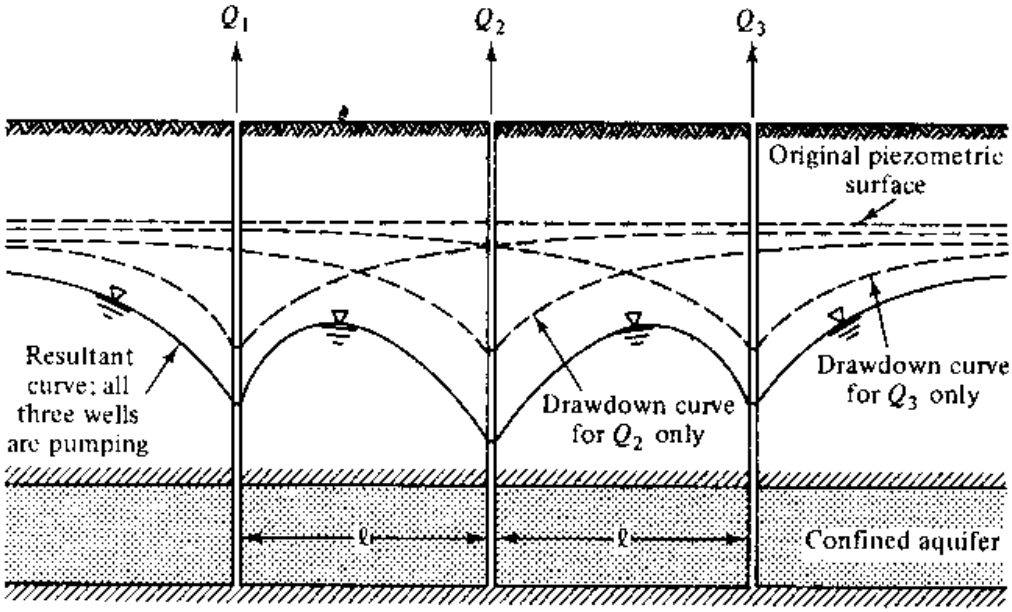


Figure 8-21 Individual and composite drawdown curves for three wells on a line.

An additional cause of declining artesian water levels is the decrease of aquifer transmissivity and storativity that results from the expansion of cones of depression into regions of the groundwater system where aquifers thin and pinch out or are otherwise bounded by low conductivity units. The Theis equation demonstrates that drawdown is inversely related to transmissivity; that is, aquifers that exhibit low values of transmissivity and storativity produce greater drawdown than aquifers of high transmissivity and storativity. Because both transmissivity and storativity are in part determined by the thickness of an aquifer, pumped wells within the cone of depression of a thinning or impermeably bounded aquifer (zero thickness) will produce greater drawdown than wells in an aquifer of constant thickness and near-infinite extent. In artesian aquifer systems that have experienced long-term groundwater withdrawals and persistently falling water levels, like that of the Virginia Coastal Plain, expanding and deepening cones of depression inevitably encroach on aquifer edges and boundaries, thereby effecting a decrease of transmissivity and storativity and accelerating the decline of water levels.

Condition 3

There is compelling hydrologic evidence to indicate that the groundwater supply of the Virginia Coastal Plain is in *overdraft*. Groundwater overdraft occurs when water is withdrawn from an aquifer system faster than it is naturally recharged. Whereas a short-term and local decline of artesian water levels may signal a temporary disruption of hydraulic equilibrium in the aquifer system, the long-term, persistent, and system-wide decline of water levels is more indicative of a permanent or near-permanent loss of groundwater from aquifer storage. Even if the loss of aquifer water is from elastic storage, low values of vertical hydraulic conductivity in the confining units militate against recharge of the aquifers at rates equal to or approximating the rates of groundwater withdrawal. Moreover, one might reasonably infer from the VADEQ maps of simulated potentiometric surfaces of the Potomac aquifer that critical surfaces have been encroached in the vicinity of the Fall Zone because of overdraft of the bounded aquifer. In any case, if the current accelerating rate of groundwater withdrawal continues for the next few decades, then there can be no doubt that overdraft will constitute the permanent condition of the groundwater supply.

NOTE: The term "groundwater" is spelled here as one word except where, in accordance with the use in Virginia Administrative Code, it is used in the context of "ground water management."

Additional comments from Frank Fletcher

If it hasn't been obvious, let me state here that I intend to come at the RAP agenda from the point of view of assessing the effects of future withdrawals on the availability of groundwater supply (and the broad socio-economic consequences). In this vein I am enclosing a Word.doc attachment that lays out in simple form a likely (if much abstracted) scenario of the future supply of the Virginia Coastal Plain. Certainly, I am not suggesting that events long in the future should alone dictate our planning for the immediate future; however, proposed solutions to current and problems should not be counter-productive to the solution of future problems. There's an old planner's saying: Subsystem goals always conflict with system goals; short-term goals always conflict with long-term goals.

THE LIFETIME OF AN ARTESIAN GROUNDWATER SUPPLY
A CONCEPTUAL MODEL

This model represents the lifetime of an artesian groundwater supply, like that of the Virginia Coastal Plain. It divides the lifetime of the resource into stages, which, while somewhat artificial, are not arbitrary. Further, the boundaries between stages are not hard and rigid lines but rather gradational zones; some conditions and elements may overlap. The model is presented in the hope that it may aid water-supply planning that is founded on analysis and interpretation of probable social, technical, and economic futures.

STAGE 1 - ERA OF ABUNDANCE AND COMPLACENCY

- Supply is abundant (i.e., resource stocks are high).
- Groundwater withdrawal (extraction) rates are low but accelerating.
- Artesian water levels stand high in wells and are falling slowly but steadily.
- Utilization costs are low because the first aquifers to be tapped are the shallowest and least expensive to exploit.
- Water supply planning and management is absent or rudimentary.

STAGE 2 - ERA OF GROWING CRISES

- The supply is in overdraft (withdrawals exceed natural recharge) and is shrinking.
- System-wide artesian water levels are falling persistently and approach or reach critical levels in many regions.
- Well interference from large water users and reduction of aquifer transmissivity and storativity accelerate the decline of groundwater levels.
- Utilization costs increase because wells of shallow and moderated depth must have pumps lowered or be redrilled, new wells must be drilled into deeper aquifers, and poorer-quality water must be utilized. Increasing costs will affect all water users but will fall disproportionately on low and middle-income households.
- As supply shrinks and utilization costs increase, the rate of groundwater withdrawal continues to increase but is decelerating.
- Increased cost of exploitation and threat of shortages spur major water-supply planning and management initiatives.

STAGE 3 - ERA OF SUPPLY RESTRUCTURING

- Groundwater in aquifer storage (stock) is reduced to a level where it is no longer adequate to meet total water demand.
- Artesian water levels have fallen to critical levels throughout the Virginia Coastal Plain.
- The remaining groundwater supply becomes very expensive to exploit.
- The high cost of groundwater utilization relative to alternative water sources and water conservation technologies reduces the role of groundwater in the water supply budget.
- Groundwater, alternative water sources, and conservation measures make up a diversified water system.

STAGE 4 - ERA OF SUSTAINABILITY